

# SMEs Adoption of ICT: Evidence from Algeria

## *L'adoption des TIC par les PME : évidences de l'Algérie*

**Laala Atik**

*Faculté de Sciences Économiques, Commerciales  
et Sciences de Gestion  
Université de Ouargla, Algérie*

**Boumediene Ramdani**

*Exeter University Business School  
University of Exeter, UK*

### Abstract

Although the value of Information and Communication Technologies (or ICT) is incontestable, their adoption by Small to Medium-sized Enterprises (or SMEs) in developing countries has been slow. Using the Technology-Organisation-Environment (or TOE) framework, this study will examine the determinants of ICT adoption by SMEs in Algeria. The results of a survey of 136 SMEs indicate that small businesses in Algeria are no longer only adopting basic ICT, but also adopting more advanced ICT such as enterprise systems. Depending on the ICT, specific technological, organisational, and environmental factors tend to influence SMEs adoption. Implications of these findings on owners/managers, ICT suppliers and policy makers will be outlined.

**Keywords:** ICT, IT, Technology, Adoption, SMEs, TOE, Small Business, Developing Country, Algeria

### ملخص

على الرغم من أن أهمية تكنولوجيا المعلومات والاتصالات لا تقبل الجدل، إلا أن تبني المؤسسات الصغيرة والمتوسطة لهذه التكنولوجيا في البلدان النامية لا يزال بطيئاً. وباستخدام إطار التكنولوجيا - التنظيم - البيئة، فإن هذه الدراسة ستحدد العوامل التي تؤثر على المؤسسات الصغيرة والمتوسطة الجزائرية في تبنيها لتكنولوجيا المعلومات والاتصالات. كما تشير نتائج الدراسة الاستقصائية لـ 136 مؤسسة إلى أن الأعمال التجارية الصغيرة في الجزائر لم تعد تتبنى فقط تكنولوجيا المعلومات والاتصالات الأساسية، بل تعتمد أيضاً تكنولوجيا معلومات واتصالات أكثر تقدماً مثل أنظمة المؤسسة.. بالإضافة إلى ذلك فإن تأثير العوامل التكنولوجية والتنظيمية والبيئية على تبني المؤسسات الصغيرة والمتوسطة يعتمد على نوع التكنولوجيا. وأخيراً سيتم تحديد آثار هذه النتائج على أصحاب المشاريع والمديرين وموردي التكنولوجيا وصناع القرار.

**الكلمات المفتاحية:** تكنولوجيا المعلومات والاتصالات، المؤسسات الصغيرة والمتوسطة، البلدان النامية.

### Introduction

Information and Communication Technologies (ICT) provide Small to Medium-sized Enterprises (SMEs) with substantial business performance opportunities. On the one hand, studies show that ICT provide SMEs with operational efficiency (Barnes et al., 2012; Sin Tan et al., 2010), help them meet customer demands (Chen et al., 2016; Naoui et al., 2014), and increase their growth and competitiveness (Yunis et al., 2017; Adeniran and Johnston, 2016). On the other hand, several barriers have been shown to prevent SMEs from adopting ICT. Doherty et al. (2015) argue that SMEs do not adopt cloud computing due to Internet connectivity concerns; Security concerns; Lack of trust in provider; Identity management concerns, cloud availability concerns, vendor lock-in concerns, data protection concerns, compliance concerns, lack of standards and delay in data transfer. Moreover, Panayiotou and Katimertzoglou (2015) argue that there are issues preventing SMEs from adopting the Internet include Infrastructure availability, cost, and knowledge of the Internet.

Although ICT benefits outweigh the barriers, the rate of ICT adoption among SMEs remains low in developing countries. However, limited studies have examined the determinants of ICT adoption by

SMEs in developing countries such as Malaysia (Ahani et al., 2017), India (Kumar et al., 2017), Vietnam (Minh et al., 2017), Lebanon (Yunis et al., 2017) and South Africa (Adeniran and Johnston, 2016). This study will contribute to this area of research with important contextual insights by examining the determinants of ICT adoption by SMEs in Algeria.

The Algerian economy is currently undergoing a major reform through diversification from ‘all oil’ to ‘all industry’ (Lamlili, 2016). According to Oxford Business Group (2017), one million SMEs employed over 2.5 million people and engaged in \$622 million in bilateral trade by the end of 2016. The government goal is to establish another one million SMEs over 2015-2019. However, the global competitiveness index ranks Algeria 86 out of 137 countries (Schwab, 2017). In this report, Algeria seems to do badly in two inter-related pillars namely business sophistication and innovation, of which ICT is a key enabler. Thus, this study aims to examine the determinants of ICT adoption by Algerian SMEs.

### Research Model

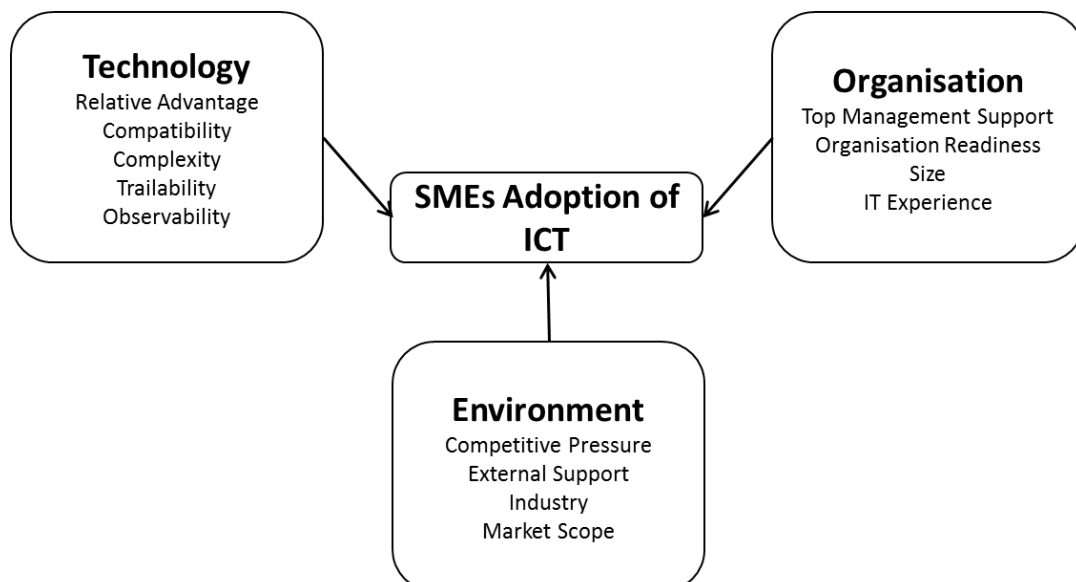
Several theories have been used to study SMEs adoption of ICT including Theory of Planned Behaviour (Grandon and Mykytyn, 2004; Riemenschneider and McKinney, 2001); Innovation Diffusion Theory (Nguyen et al., 2013; Ruivo et al., 2013; Kendall et al., 2001; Nooteboom et al., 1992); Resource-based view (Adeniran and Johnston, 2016; Chen et al., 2016; Ruivo et al., 2013; Chao and Chandra, 2012; Harrigan et al., 2010) among others. However, the vast majority of studies looking at the determinants of ICT adoption by SMEs use the Technological-Organisational-Environmental (or TOE) framework that was introduced by Tornatzky et al. (1990). Table 1 summarises the studies using TOE framework to specify the determinants of ICT adoption by SMEs. The TOE framework has not only been used in several small business studies, but also been used to assess the determinants of several technologies including: e-business (Chatzoglou et al., 2016; Ifinedo, 2011); mobile marketing (Maduku et al., 2016); e-commerce (Hamad et al., 2015; Scupola, 2003); website (Hung et al., 2014); enterprise applications and systems (Ramdani et al., 2013; Ramdani et al., 2009); and Electronic Data Interchange (or EDI) (Kuan and Chau, 2001).

**Table 1. TOE factors influencing SMEs adoption of ICT**

Studies	ICT Adoption	Technological Context	Organisational Context	Environmental Context
Chatzoglou et al. (2016)	E-Business	IT infrastructure	Internet skills; Firm size; Firm scope; CEO's knowledge; Adoption cost	Willingness and capabilities of supply chain partners; Competitive pressure; Government support; Consumer readiness;
Maduku et al. (2016)	Mobile Marketing	Relative advantage; Complexity; Cost	Top management; Financial resource; Employee capability	endor support; Competitive pressure; Customer pressure
Hamad et al. (2015)	E-Commerce	Relative advantage; Compatibility; Complexity	Top management support; Firm size	Competitive pressure; Business partner pressure; Government support
Hung et al. (2014)	Website	Awareness of Corporate Website	Enterprise Resources; Corporate Website Governance; Senior Executive Commitment; Technological Resources; Human Resources	Consultant Support; Supporting Industry e-Readiness; Government e-Readiness; Market Force e-Readiness

Ramdani et al. (2013)	Enterprise Applications	Relative advantage; Compatibility; Complexity; Trialability; Observability	Top management support; Organisational readiness; ICT experience; Size	Industry; Market scope; Competitive pressure; External ICT support
Ifinedo (2011)	E-Business	Perceived benefits	Organizational ICT competency; Management commitment and support	External pressure; IS vendor support; Financial support availability
Ramdani et al. (2009)	Enterprise Systems	Relative advantage; Compatibility; Complexity; Trialability; Observability	Organisational readiness; top management support; IS experience; Size	Industry; Market scope; Competitive pressure; External IS support
Scupola (2003)	E-commerce	E-commerce Barriers, E-commerce Benefits, Related Technologies	Innovation Champion, Employees' IS Knowledge	Pressure from Competitors, Buyers, and Suppliers, Role of Government, Technology Support Infrastructure
Kuan and Chau (2001)	EDI	Perceived Direct Benefits	Perceived Financial Cost, Perceived Technical Competence	Perceived Industry Pressure, Perceived Government Pressure

To examine the determinants of ICT adoption by SMEs in Algeria, we use Ramdani et al.'s (2009) framework. This model was used to assess the determinants of enterprise systems' adoption by SMEs in the UK. We use this framework for three reasons. First, this framework has been used in the context of SMEs adoption of ICT. Second, it has proven its usefulness to assess the determinants of enterprise systems' adoption (Ramdani et al., 2013). Third, this framework has not been used in a developing country context.



**Figure 1.** SMEs adoption of ICT framework (Ramdani et al., 2009)

### Research Method

In order to empirically test our research model, interviewer-administered survey was conducted. We used a convenient snowballing approach due to the difficulty to obtain data from SMEs owners and managers in Algeria. A total of 136 SMEs were surveyed. Sample characteristics are summarised in

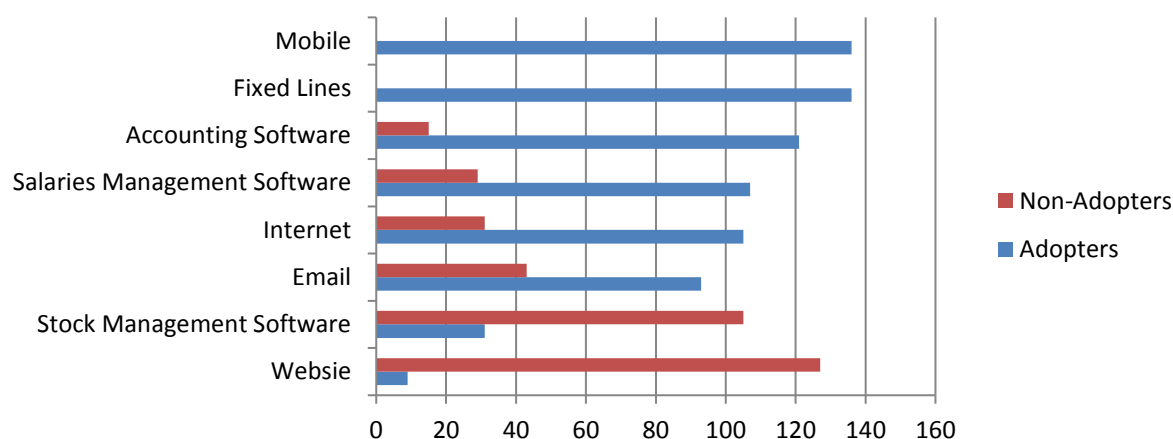
Table 1. The questionnaire was translated into Arabic and French following the conventional forward-then-back-translation approach taking into account local culture and dialect considerations. Measures employed in this study were adapted from Ramdani et al.'s (2009) study. All measurement items are listed in the Appendix.

**Table 2. Summary Statistics**

Variables	Frequency	%
<b>Size</b>		
0-9	126	92.6
10-49	10	7.4
<b>Industry</b>		
Manufacturing	83	61.0
Retail	40	29.4
Services	13	9.6
<b>Market Scope</b>		
Local	115	84.6
National	21	15.4
<b>IT Experience</b>		
Low	114	83.8
High	22	16.2

## Results & Discussion

Figure illustrates that SMEs in Algeria are no longer only adopting basic ICT such as fixed telephone line and the Internet, but also adopting more advanced ICT such as enterprise systems.



**Figure 2. ICT Adoption among SMEs in Algeria**

Since the dependent variable was dichotomous (non-adopters versus adopters), we used Logistic regression. This technique has been used by previous studies (e.g. Delerue and Cronje, 2015; Nguyen et al., 2013; Ramdani et al., 2009). Analysis was performed on SMEs adoption of three enterprise systems namely Accounting Software (Table 2), Salaries Management Software (Table 3), and Stock Management Software (Table 4).

As shown in Table 2, relative advantage, observability, top management support, organisational readiness and external support are significantly related to SMEs adoption of accounting software.

**Table 3. Results of Logistic Regression (SMEs adoption of Accounting Software)**

	B	S.E.	Wald	df	Sig.	Exp(B)
<b>Relative Advantage</b>	1.568	.685	5.241	1	<b>.022</b>	4.797
Compatibility	-1.211	.924	1.717	1	.190	.298
Complexity	1.285	1.088	1.395	1	.237	3.614
Trialability	9.111	2957.989	.000	1	.998	9051.125
<b>Observability</b>	-1.280	.557	5.276	1	<b>.022</b>	.278
<b>Top Management Support</b>	-1.162	.605	3.694	1	<b>.055</b>	.313

<b>Organisational Readiness</b>	-1.477	.669	4.880	1	<b>.027</b>	.228
Size	4.767	3.140	2.305	1	.129	117.551
IT Experience	-1.808	1.708	1.120	1	.290	.164
Competitive Pressure	-.243	.615	.156	1	.693	.785
<b>External Support</b>	-2.782	1.040	7.160	1	<b>.007</b>	.062
Industry	1.290	1.215	1.127	1	.288	3.633
Market Scope	.134	2.142	.004	1	.950	1.144
Constant	1.730	373.782	.000	1	.996	5.638

Results from the Logistic regression on SMEs adoption of salaries management software indicate that top management support, organisational readiness and external support are significant determinants.

**Table 4 Results of Logistic Regression (SMEs adoption of Salaries Management Software)**

	B	S.E.	Wald	df	Sig.	Exp(B)
Relative Advantage	.665	.468	2.019	1	.155	1.944
Compatibility	-.128	.631	.041	1	.840	.880
Complexity	.477	.754	.400	1	.527	1.611
Trialability	9.069	3153.379	.000	1	.998	8680.490
Observability	.029	.449	.004	1	.948	1.030
<b>Top Management Support</b>	-1.723	.503	11.739	1	<b>.001</b>	.179
<b>Organisational Readiness</b>	-.970	.493	3.863	1	<b>.049</b>	.379
Size	1.698	1.970	.744	1	.389	5.464
IT Experience	-2.180	1.265	2.970	1	.085	.113
Competitive Pressure	-.716	.518	1.911	1	.167	.489
<b>External Support</b>	-1.210	.636	3.618	1	<b>.057</b>	.298
Industry	.362	.650	.310	1	.578	1.436
Market Scope	-.230	1.496	.024	1	.878	.795
Constant	2.967	398.472	.000	1	.994	19.427

As shown in Table 4, complexity, IT experience, and industry are significantly related to SMEs adoption of stock management software.

**Table 5. Results of Logistic Regression (SMEs adoption of Stock Management Software)**

	B	S.E.	Wald	df	Sig.	Exp(B)
Relative Advantage	1.596	1.071	2.220	1	.136	4.935
Compatibility	-1.673	1.052	2.528	1	.112	.188
<b>Complexity</b>	4.270	1.558	7.513	1	<b>.006</b>	71.536
Trialability	1.171	.716	2.674	1	.102	3.224
Observability	-.876	.846	1.071	1	.301	.417
Top Management Support	-.031	.752	.002	1	.967	.969
Organisational Readiness	.023	.640	.001	1	.971	1.024
Size	-.607	1.652	.135	1	.713	.545
<b>IT Experience</b>	-2.580	.881	8.580	1	<b>.003</b>	.076
Competitive Pressure	-.022	.758	.001	1	.977	.978
External Support	-.228	.739	.095	1	.758	.796
<b>Industry</b>	1.258	.618	4.152	1	<b>.042</b>	3.520
Market Scope	1.339	1.564	.733	1	.392	3.814
Constant	-2.442	1.305	3.502	1	.061	.087

It is clear from the results presented above that SMEs are influenced by technological, organisational and environmental factors in their adoption of enterprise systems. In terms of technological context, SMEs adoption of Accounting Software is influenced by the perceived usefulness of the technology and whether it has been adopted by other SMEs. Unlike the adoption of the other two enterprise

systems, SMEs adoption of Salaries Management Software is influenced by the complexity of the system. In terms of the organisational context, both Accounting Software and Salaries Management Software adoptions are influenced by the owners/ managers' support and whether the SME is technologically and financially ready to adopt such systems. In terms of environmental context, SMEs adoption either Accounting Software or Salaries Management Software are influenced by the support provided by vendors/ suppliers. Unlike the adoption of the other two enterprise systems, SMEs adoption of Salaries Management Software is influenced by the industry in which the SME operates.

## Conclusion

The results of a survey of 136 SMEs indicate that small businesses in Algeria are no longer only adopting basic ICT, but also adopting more advanced ICT such as enterprise systems. Moreover, SMEs are influenced by technological, organisational and environmental factors in their adoption of enterprise systems. Depending on the enterprise system, specific technological, organisational, and environmental factors tend to influence SMEs adoption. SMEs adoption of Salaries Management Software is not influenced by any technological factors, whereas the adoption of accounting software is influenced by relative advantage and observation, and the adoption of Stock Management Software is influenced by complexity. While the adoption of both Accounting Software and Salaries Management Software are influenced by top management support, and organisational readiness, SMEs adoption of Stock Management Software is influenced by IT experience. The adoption both Accounting Software and Salaries Management Software are influenced by external support, whereas the adoption of Stock Management Software is influenced by the industry in which the SME operates.

Our study results have implications not only for owners/managers of SMEs, but also for ICT suppliers and policy makers. Owners/ managers of SMEs can facilitate the adoption of advance ICT by supporting new ICT initiatives through investments in new technology as well as improving the technological competence of firm. In order to get SMEs to adopt more advanced ICT, developers and suppliers need to ensure that support services are available to SMEs. Finally, policy makers should promote the adoption of advanced ICT since this can improve business sophistication and innovation and as a result this will accelerate the implementation of new diversified economy.

Several limitations must be considered when interpreting the results of this study. First, this study focuses only on SMEs adoption of advanced ICT. To gain a holistic understanding, both basic ICT and advanced ICT must be assessed. Second, a set of technological, organisational and environmental determinants (Ramdani et al., 2009) were examined. Future studies may examine whether other determinants may influence SMEs' adoption of ICT. Third, the collected data is cross-sectional. Future studies could collect qualitative longitudinal data to examine the reasons behind the adoption of particular ICT.

## References

- Chatzoglou, P., and D. Chatzoudes. 2016. Factors affecting e-business adoption in SMEs: an empirical research. *Journal of Enterprise Information Management* 29 (3): 327–58.
- Chen, Y.-Y. K., Y.-L. Jaw, and B.-L. Wu. 2016. Effect of digital transformation on organisational performance of SMEs. *Internet Research* 26 (1): 186–212.
- Grandon, E. E., and P. P. Mykytyn Jr. 2004. Theory-based instrumentation to measure the intention to use electronic commerce in small and medium sized businesses. *Journal of Computer Information Systems* 44 (3): 44–57.
- H. Nguyen, T., and T. S. Waring. 2013. The adoption of customer relationship management (CRM) technology in SMEs. Edited by Paul Jones, Gary Packham and Martin Beck. *Journal of Small Business and Enterprise Development* 20 (4). Emerald Group Publishing Limited: 824–48.

- Hamad, H., I. Elbeltagi, P. Jones, and H. El-Gohary. 2015. Antecedents of B2B E-Commerce Adoption and its Effect on Competitive Advantage in Manufacturing SMEs. *Strategic Change* 24 (5). John Wiley & Sons, Inc.: 405–28.
- Harrigan, P., A. Schroeder, I. Qureshi, Y. Fang, P. Ibbotson, E. Ramsey, and D. Meister. 2010. Internet Technologies, ECRM Capabilities, and Performance Benefits for SMEs: An Exploratory Study. *International Journal of Electronic Commerce* 15 (2): 7–46.
- Hung, W.-H., L.-M. Chang, C.-P. Lin, and C.-H. Hsiao. 2014. E-readiness of website acceptance and implementation in SMEs. *Computers in Human Behavior* 40. Elsevier Ltd: 44–55.
- Ifinedo, P. 2011. Internet/e-business technologies acceptance in Canada's SMEs: an exploratory investigation. *Internet Research* 21 (3): 255–81.
- Kendall, J. D., L. L. Tung, K. H. Chua, C. H. D. Ng, and S. M. Tan. 2001. Receptivity of Singapore's SMEs to electronic commerce adoption. *The Journal of Strategic Information Systems* 10 (3). Elsevier B.V.: 223–42.
- Lamlili N. (2016). Les 3 messages d'Abdelmalek Sellal aux Algériens sur l'état de santé de leur Économie, *Jeune Afrique*, December 29. <http://www.jeuneafrique.com/388080/economie/3-messages-dabdelmalek-sellal-aux-algeriens-letat-de-sante-de-economie/>
- Maduku, D. K., M. Mpinganjira, and H. Duh. 2016. Understanding mobile marketing adoption intention by South African SMEs: A multi-perspective framework. *International Journal of Information Management* 36 (5). Elsevier Ltd: 711–23.
- Minh, N. D., L. Q. Dat, N. H. Son, P. M. Tuan, and N. D. Toan. 2017. Application of visual management in small medium enterprises in Vietnam. *International Journal of Entrepreneurship and Innovation Management* 21 (6): 509.
- Naoui, F. 2014. Customer service in supply chain management: a case study. *Journal of Enterprise Information Management* 27 (6). Journal of Enterprise Information Management: 786–801.
- Nooteboom, B., C. Coehoorn, and A. Van Der Zwaan. 1992. The Purpose and Effectiveness of Technology Transfer to Small Businesses by Government-sponsored Innovation Centres. *Technology Analysis & Strategic Management* 4 (2): 149.
- Panayiotou, N. A., and P. K. Katimertzoglou. 2015. Micro firms internet adoption patterns: the case of the Greek jewellery industry. *Journal of Enterprise Information Management* 28 (4): 508–30.
- Oxford Business Group (2017). SMEs drive growth in non-energy sectors of the Algerian economy. <https://oxfordbusinessgroup.com/>
- Ramdani P. Lorenzo, O., B. K. 2009. Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management* 22 (1/2): 10–24.
- Ramdani, B., D. Chevers, and D. A. Williams. 2013. SMEs' adoption of enterprise applications. Edited by Dr Paul Jones, Professor Gary Packham. *Journal of Small Business and Enterprise Development* 20 (4). Emerald Group Publishing Limited: 735–53.
- Riemenschneider, C. K., and V. R. McKinney. 2001. Assessing belief differences in small business adopters and non-adopters of web-based e-commerce. *Journal of Computer Information Systems* 42 (2): 101.
- Ruivo, P., T. Oliveira, B. Johansson, and M. Neto. 2013. Differential Effects on ERP Post-Adoption Stages across Scandinavian and Iberian SMEs. *Journal of Global Information Management* 21 (3): 1–20.
- Scupola, A. 2009. SMEs' e-commerce adoption: perspectives from Denmark and Australia. *Journal of Enterprise Information Management* 22 (1/2): 152–66.
- Sin Tan, K., S. Choy Chong, B. Lin, and U. Cyril Eze. 2010. Internet-based ICT adoption among SMEs. *Journal of Enterprise Information Management* 23 (1). Emerald Group Publishing Limited: 27–55.
- Schwab, C. (2017). Global Competitiveness Report 2017-2018. World Economic Forum, Geneva, <https://www.weforum.org/>
- Yunis, M., A.-N. El-Kassar, and A. Tarhini. 2017. Impact of ICT-based innovations on organizational performance. *Journal of Enterprise Information Management* 30 (1): 122–41.

## **Appendix**

### **Relative Advantage**

Adopting ICT will enable employees to accomplish tasks more quickly.  
Adopting ICT will improve the quality of work we do.  
Adopting ICT will make employees' job easier to do.  
Adopting ICT will enhance the employees effectiveness on the job.  
Adopting ICT will offer employees greater control over their work.

### **Compatibility**

Adopting ICT will be compatible with all aspects of work.  
Adopting ICT will fit well with the way we like to work.  
Adopting ICT will fit into our work style.

### **Complexity**

My interaction with ICT will be clear and understandable.  
I believe that it will be easy to get ICT to do what employees want it to do.  
Overall, I believe that the ICT will be easy to use.  
Learning to operate ICT will be easy for employees.

### **Trialability**

Before deciding whether to adopt any ICT, it will be essential to be able to properly try them out.  
It is essential to be able to use ICT on a trial basis long enough to see what they could do.

### **Observability**

In the industry which my firm operates in, one sees ICT adopted by many firms.  
ICT are not very visible in the industry.

### **Top Management Support**

I believe it is essential for CEO to be involved in information requirement analysis.  
I feel it is not essential for CEO to be involved in reviewing consultant's recommendations.  
I believe it is necessary for CEO to be involved in decision-making.  
CEO has nothing to do with the ICT adoption project monitoring.

### **Organisational Readiness**

Our firm has the financial resources to adopt ICT.  
Our firm has the technological resources to adopt ICT.

### **Competitive Pressure**

I believe we will lose our customers to our competitors if we will not adopt these new ICT.  
I feel it is a strategic necessity to use ICT to compete in the marketplace.

### **External Support**

I feel it is not necessary to have adequate technical support before ICT adoption.  
I believe it is necessary to have adequate technical support after ICT adoption.  
I feel it is necessary to pursue ICT supplier offering adequate advice.  
ICT supplier providing adequate training will not be essential.  
I believe that a good relationship with other parties will be crucial.